

Life Cycle Assessment of Prefabrication Construction: A Review

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Outline

1. Introduction
2. Research Methodology
3. Finding and Discussion
4. Conclusion
5. Questions and Answer



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Introduction

The construction industry is responsible for:

- Around 40% of the energy consumed,
- 39% of the global CO2 emissions, and
- 35% of landfill wastes.
- consumes about 50% of the global materials and water resources

(Kamali et al., 2019)



Introduction



Introduction



Introduction



Prefabrication construction:

- Save construction time 30~50%
- Higher quality
- Higher safety
- Lower labour intensive
- Better environment performance

Adoption rate:

- 2-3% for resident buildings in US,
- 9% in Germany,
- 2% in United Kingdom,
- 12-16% in Japanese, and
- 3-5% in Australia

Introduction

Aim

Sustainability of Prefabrication Construction compared to traditional construction method

Questions:

1. What are the benefits of prefabrication construction method?
2. How sustainable the prefabricated construction method compared with the traditional method?



Research Methodology

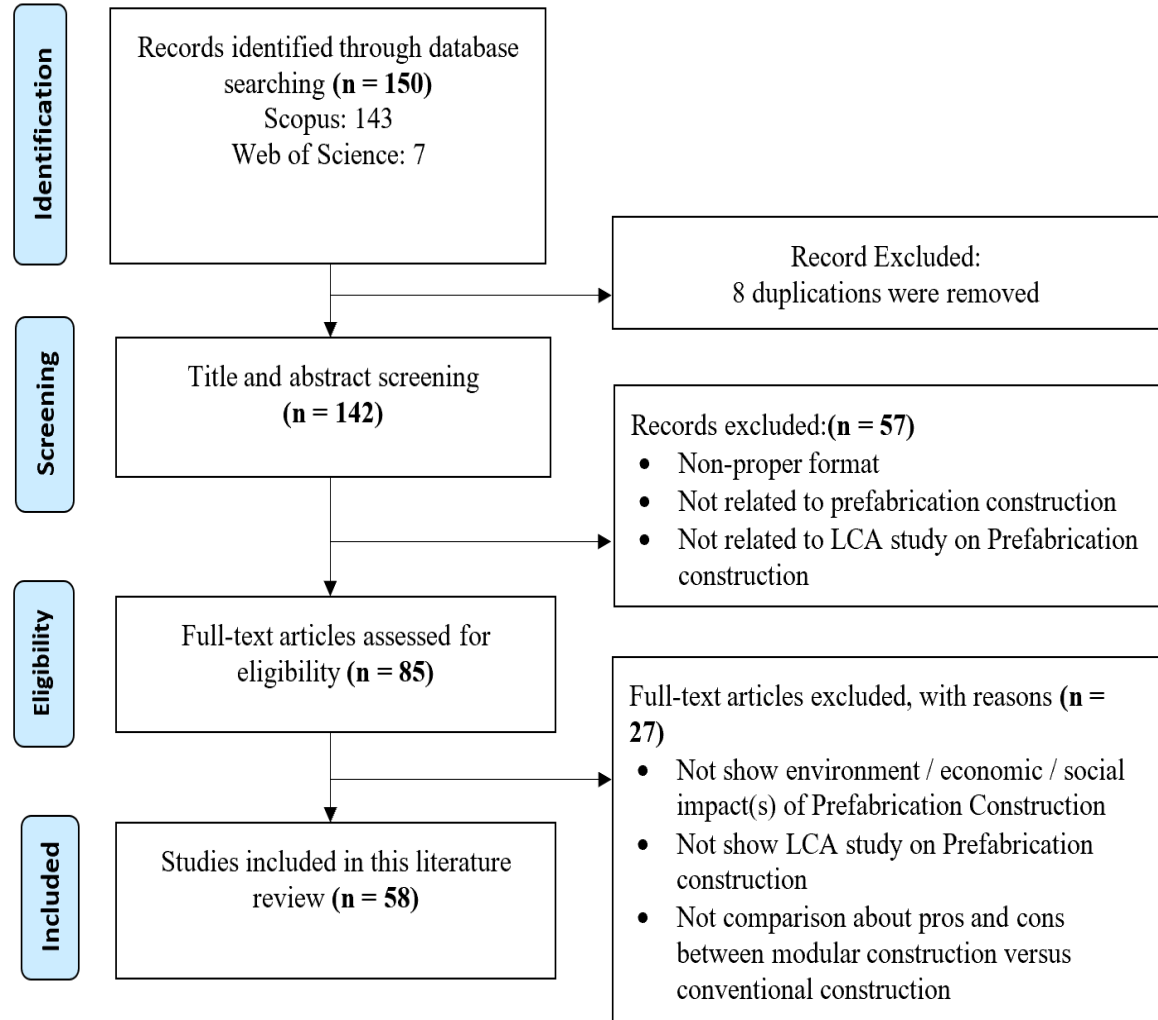
DATA COLLECTION:

- Scopus & Web of Science
- 5 Keyword Groups:

| Keywords Group 1 | Keywords Group 2 | Keywords Group 3 | Keywords Group 4 | Keywords Group 5 |
|-----------------------------|---------------------------|-----------------------|---------------------|---------------------|
| Modular construction | Conventional construction | Life cycle assessment | Vietnam | Comparative |
| Prefabrication construction | Traditional Construction | Life cycle cost | | Comparison |
| Prefabricated construction | Onsite construction | | | |
| Offsite Prefabrication | Onsite prefabrication | | | |
| Offsite construction | Onsite concrete | | | |
| Prefabricated concrete | Onsite Casting | | | |
| Offsite concrete | | | | |

Research Methodology

DATA ANALYSIS:



Findings and Discussion

1. Prefabrication Construction

- Innovative construction method
- Offers a wide range of benefits, including
 - time-saving,
 - higher quality and safety, and
 - lower labour intensive

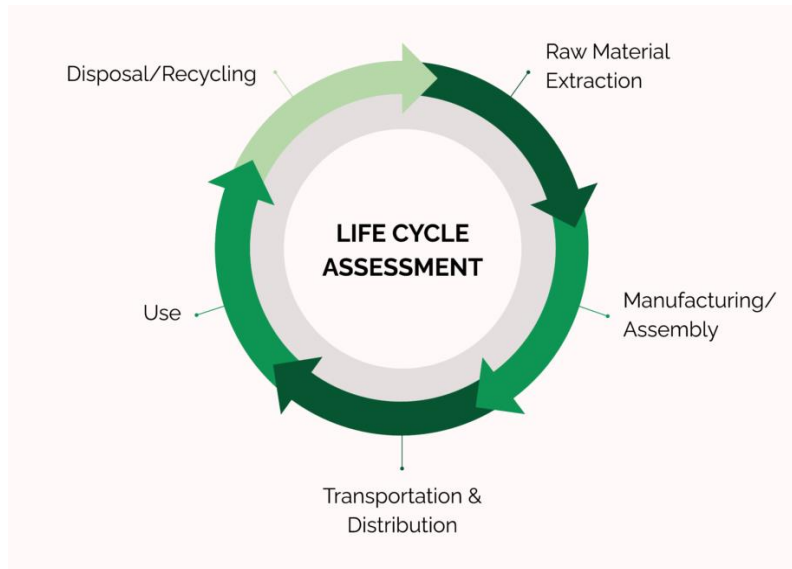
But:

- Low adoption rate
- Potential growth



Findings and Discussion

2. LCA & LCA Framework



Findings and Discussion

3. Environment Sustainability

- Many studies used LCA to investigate environment sustainability
- Most studies are focused on energy performance, carbon emissions and greenhouse gas emissions
- Only a few studies:
 - Explore full environmental indicators,
 - or cover the life cycle stages of prefabrication buildings



Findings and Discussion

4. Economic Sustainability

- a key factor of sustainability (Kamali et al., 2022)
- One of the few barriers that promote the potential growth of off-site prefabricated buildings (Ferdous et al. 2019)
- Varies from studies to studies
- Varies among countries (Tavares and Freire, 2022)



Findings and Discussion

5. Social Sustainability



- Social aspect has been neglected so far
(Balasbaneh and Sher, 2021)
- No considerable studies on these buildings' economic and social sustainabilities
(Kamali and Hewage, 2017)



- More research is needed on prefabrication construction to support the wide dissemination of this construction technique
- Address three dimensions of sustainability pillars to have a holistic view of prefabrication construction technique
- Economic dimension should be evaluated comprehensively to encompass the critical barrier and promote this construction technique

thank
you!

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